Section: Anaesthesiology

Original Research Article

NERVE STIMULATOR GUIDED SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES: COMPARISON OF LEVOBUPIVACAINE (0.5%) WITH CLONIDINE (1µg/kg) AND LEVOBUPIVACAINE (0.5%) WITH DEXMEDETOMIDINE (1µg/kg)

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ABSTRACT

Background: Alpha 2 adrenergic agonists are added to local anaesthetics to increase the duration of block and provide better analgesia. The present study was aimed at comparing dexmedetomidine and clonidine as adjuvants to levobupivacaine in nerve stimulator guided supraclavicular brachial plexus block (SCBPB) in patients undergoing upper limb surgeries.

Materials and Methods: 80 adult patients of age group 18-60 years, belonging to American society of anesthesiologists (ASA) grade I & II undergoing upper limb surgeries under nerve stimulator guided supraclavicular block were included in the study. Each group consisting of 40 patients received 30 ml of 0.5% levobupivacaine with clonidine 1 µg/kg diluted to 1 ml of NS (Group LC) and 30 ml of 0.5% levobupivacaine with dexmedetomidine 1µg/kg diluted to 1 ml of NS (group LD) with nerve stimulator guided supraclavicular brachial plexus block. The onset and duration of sensory and motor block and VAS score was compared in both the groups.

Results: The onset of motor and sensory block was comparable in both the groups. The duration of sensory block and motor block was significantly prolonged in group LD in comparison to group LC ($p < 0.0001$, $p < 0.0001$). VAS score was significantly lower in group LD at 5,6 and 9 hrs ($p < 0.0001$)

Conclusion: 1mcg/kg dexmedetomidine is superior to 1 mcg/kg clonidine as an adjuvant to levobupivacaine in nerve stimulator guided supraclavicular brachial plexus block as it provides longer duration of sensory block, motor block and lower VAS score.

Keywords: Dexmedetomidine, clonidine, sensory block, motor block, analgesia.

INTRODUCTION

Supraclavicular brachial plexus block provides adequate anaesthesia and extended post-operative analgesia for surgeries of distal humerus, around elbow, forearm and hand. The availability of peripheral nerve stimulator has contributed to the improved success of the block with less number of complications. Various local anaesthetics have been used to produce brachial plexus block. Bupivacaine 0.5% is one of the most popular drugs used because of its higher potency and prolonged duration of action. One of the drawbacks of bupivacaine is its cardiotoxicity especially when injected accidentally into the subclavian artery. The cardio toxicity may be life threatening as the arrhythmias that are produced are resistant to all routinely used anti arrhythmics. Hence there is a need for a drug which can have all

the advantages of bupivacaine without its cardio toxicity. Levobupivacaine, S-enantiomer of bupivacaine is claimed to have safer pharmacological profile,[1,2] with lesser cardiac and neurological adverse effects,[3,4] due to its faster protein binding rate.[5] As local anaesthetic action is for limited period, post-operatively pain is perceived after this duration. Various adjuvants are in use to hasten the onset of block and prolong the duration of post-operative analgesia like tramadol, buprenorphine, dexamethasone etc. The search for an ideal adjuvant is an ongoing process. Alpha 2 agonists like clonidine and dexmedetomidine have broadened the safety profile of local anaesthetics. The present study has been under taken to evaluate the effect of adding clonidine and dexmedetomidine to levobupivacaine in supraclavicular brachial plexus blockade.

MATERIALS AND METHODS

The present double blind randomized study "Nerve stimulator guided supraclavicular brachial plexus block for upper limb surgeries: comparison of levobupivacaine (0.5%) with clonidine (1µg/kg) and levobupivacaine (0.5%) with dexmedetomidine (1µg/kg)", was carried out in 80 patients of either sex in the age group of 18-60 years of ASA class I and II in the department of Anaesthesiology and critical care, at RIMS, Kadapa during the study period between January 2015- August 2016. The study was undertaken after obtaining ethical committee clearance and written informed consent from patients. Patients were randomized into two groups with 40 patients in each group

GROUP- LC: 30 ml of 0.5% levobupivacaine + clonidine 1µg/kg diluted to 1 ml of normal saline (total 31 ml).

GROUP- LD: 30 ml of 0.5% levobupivacaine + dexmedetomidine 1µg/kg diluted to 1 ml of normal saline (total 31 ml).

Randomization and blinding: After checking for eligibility, patients were enrolled and randomized into two groups using computer generated random numbers and blinding was done using opaque sealed envelopes. Neither the patient nor the anaesthesiologist administering the block and monitoring the patient postoperatively were aware of group allocation.

During preoperative visit patient's detailed history, general physical examination and systemic examination were evaluated. Routine investigations like haemoglobin, blood sugar, blood urea, serum creatinine, chest X-ray, ECG were done in all patients. Basic demographic characters like age, sex, height and weight were recorded. During pre-anaesthetic checkup, linear Visual Analogue Scale was explained to all patients and written informed consent was obtained.

PREMEDICATION

All the patients received Tab. Alprazolam 0.25 mg orally the night before surgery.

PROCEDURE

On arrival of patients in the operating room, standard monitoring-ECG, pulse oximetry, NIBP were attached. Preoperative vital data such as pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure and oxygen saturation (spo2) were noted. An intravenous line was established with 18G I.V cannula and an infusion of Ringers lactate was started. All patients were explained about the procedure of anaesthesia.

Position and preparation

- Position the patient supine with the back slightly elevated. A small shoulder roll may be placed for slight neck extension.
- Supplemental oxygen 3L/min was given via polymask.
- Inj.Midazolam 1 mg and Inj.Fentanyl 50 µg was given intravenously.

Identification of surface anatomy: The patient is placed in supine position, with the head turned away from the side to be blocked. The arm to be anaesthetized should be adducted and the hand should be extended along the side. The midpoint of the clavicle should be identified and marked. The posterior border of the sternocleidomastoid can be easily palpated when the patient raises the head slightly. The palpating fingers can then roll over the belly of the anterior scalene muscle into the interscalene groove, where a mark should be made approximately 1.5 to 2.0 cm posterior to the midpoint of the clavicle. Palpation of the subclavian artery at this point confirms the landmark. After injection of a skin wheal with 26 G, the anesthesiologist stands at the side of the patient. A 21-gauge, 50 mm insulated, short beveled needle is directed in caudal and posterior direction until required motor response is elicited using nerve stimulator, with a current of 0.5 mA for 0.1 msec at 2 Hz. After localization of the brachial plexus, aspiration for blood should be performed before incremental injections of a total volume of 31 ml of study drug.

BLOCK ASSESSMENT: Sensory and motor functions in the contra lateral limb were used for comparison purposes. Sensory function was assessed by pin prick using 23 G needle in all the areas supplied by individual nerves and scored. 0-sharp pin prick felt, 1-analgesia, dull sensation felt 2-analgesia, no sensation Motor block was assessed by modified bromage scale for upper extremities on a 3-point scale. A modified Bromage scale: 0-Normal motor function with full flexion and extension of elbow, wrist and fingers. 1-Decrease in motor strength with ability to move fingers and/ or wrist. 2-Complete motor blockade with inability to move fingers. Assessments were terminated when anaesthesia was deemed complete or after 30 minutes elapsed or whichever came first.

Duration of sensory blockade: It is the time from the onset of sensory blockade to onset of pain at the surgical site. Duration of motor blockade: It is the time from the onset of motor blockade to the

complete recovery. The quality of the nerve blockade was evaluated prior to surgical incision, using 4 point scale. 1 = complete failure (converted to General Anaesthesia) 2 = Insufficient block (inadequate analgesia, inadequate relaxation, or patient requiring supplemental analgesia) 3= satisfactory block. (Minimal complaint-no need of analgesia) 4= excellent block-no complaints. Sedation during block was assessed using Ramsay sedation score 1-anxious/restless/both 2-cooperative, oriented, tranquil 3-responds to commands, 4-brisk response to stimulus, 5-sluggish response to stimulus 6-no response to stimulus. Duration of analgesia-time from onset of sensory block to VAS score more than 4 in 24 hrs post operatively. Successful block of brachial plexus block was defined as presence of adequate motor block; absent sensation to pin prick sensation within 30 minutes of injection.

Failed block is defined as "absence of surgical anaesthesia at 30 minutes in at least one of the tests or need to convert to general anaesthesia for completion of surgery."

Monitoring

Both the patient and investigator making observation were unaware of drugs administered. Motor and sensory blockade were evaluated at 0,1,2,3,4,5,6,7,8,9,10 minutes after giving the drug. All vital data like pulse rate, BP, spo2, and ECG were monitored. All patients were observed for complications like nausea, vomiting, pruritus, haematoma and pneumothorax.

POST OPERATIVE OBSERVATION: All patients were observed for side effects like tachycardia, bradycardia, respiratory depression, hypotension, nausea, vomiting, pruritus etc. Visual analogue scale was observed every half an hour for 24 hrs post operatively. Patients received rescue analgesia, injection paracetamol 15 mg/kg IV when VAS is >/= 4.

Based on the results of pilot study; to detect a 25% difference in the duration of analgesia with 95% confidence interval and 80% power of study, we needed 28 patients in each group. to compensate for loss to follow up and failed block, we included 40 patients in each group. quantitative data was expressed as mean and SD and analyzed using student's t test, and qualitative data was expressed as percent or fraction and analyzed using chi square test. P value less than 0.05 was considered as statistically significant. Data was analyzed using MedCalc - version 23.0.9 software, Belgium.

RESULTS

The present study was done in 80 patients of ASA grade I and II divided into two groups of 40 patients each, received 31 ml of study drug, with 2 failures in each group. A total of 76 patients, 38 in each group were considered for final analysis.

Demographic data and duration of surgery was comparable in both the groups (table 1).

Table 1: Demographic data and duration of surgery

	Group LC (n = 38)	Group LD (n = 38)	P value
Age (in years)	44.34±12.079	39.53±13.017	0.0992
Sex (M/F)	23/15	23/15	1
Weight	60.92±10.159	58.89±9.319	0.3670
Duration of surgery (in minutes)	98.6±12.6	99.8±11.8	0.6695

Table 2: Block characteristics

Block characteristics	Group LC Mean±SD	Group LD Mean±SD	P value
Onset of sensory block (in mins)	7.13±0.741	7.16±0.718	0.8582
Onset of motor block (in mins	12.11±1.828	11.9±1.414	0.5771
Duration of sensory block (in hrs)	4.013±0.51	7.522 ±0.89	<0.0001
Duration of motor block (in hrs)	4.56±0.594	8.9±0.866	<0.0001

The onset of motor and sensory block was comparable in both the groups. The duration of sensory block, motor block and duration of analgesia was significantly prolonged in group A (table 2).

Table 3: Postoperative VAS score

VAS score	Group-LC(n=38)	Group-LD (n=38)	P value
Immediate post operative	0	0	
30 min	0	0	
60 min	0	0	
2 hrs.	0	0	
3hrs.	0	0	
4 hrs.	0	0	
5 hrs.	39.44 ± 16.66	25.8 ±9.8	<0.0001
6 hrs.	56.66 ± 20.37	30.71 ±9.75	<0.0001
9 hrs.	27.14 ±8.09	41.66 ± 18.25	<0.0001

SEDATION-Comparison in two groups

Sedation	Group LC	Group LD	P value
0 min	2.16 ±0.370	2.12 ±0.359	0.6339
10 min	2.11± 0.311	2.24± 0.634	0.2601
15 min	2.08 ±0.273	2.24 ±0.431	0.057
30 min	2.00 ±0.000	2.11± 0.311	0.0324
45 min	1.97±0.162	2.03 ±0.162	0.1107
60 min	1.84 ±0.370	2.03 ±0.162	0.0049
90 min	1.89 ±0.311	2.00± 0.000	0.0324

At the time of drug administration, there was no significant difference in LC and LD groups regarding sedation. Sedation of LD group was statistically significant at 30, 60 and 90 min when compared to LC group.

DISCUSSION

Dexmedetomidine and clonidine are both a2 selective agonists. It is possible that they work in a similar manner and may indicate a class effect. There are four proposed mechanisms for the action of dexmedetomidine and clonidine in peripheral nerve blocks. They are central mediated analgesia, alpha adrenoceptor mediated vasoconstrictor effect, attenuation of inflammatory response and direct action on peripheral nerve. Dexmedetomidine and clonidine enhance activity dependent hyperpolarization generated by the Na/K pump during repetitive stimulation, increases the threshold for initiating the action potential causing slowing or blockade of conduction.

In this study, we found that the duration of sensory block, motor block, and duration of analgesia was significantly prolonged in dexmedetomidine group in comparison to clonidine group. Vinod Hosalli et et al,[6] compared dexmedetomidine and clonidine as an adjuvant to levobupivacaine in USG guided axillary brachial plexus block and observed that dexmedetomidine group had longer duration of sensory block, motor block and analgesia. Don Sebastian et al,[7] compared dexmedetomidine and clonidine as an adjuvant to ropivacaine in supraclavicular brachial plexus block and observed that dexmedetomidine group had faster onset of sensory and motor block, longer duration of sensory and motor block and analgesia. Singh et al,[8] and Harshavardhana et al,[9] also found that dexmedetomidine is a superior adjuvant than clonidine, as it provides longer duration of motor and sensory block and analgesia.

CONCLUSION

It can be concluded that dexmedetomidine (1µg/kg) hastens the onset of motor block, prolongs the duration of sensory and motor block, enhances the quality of block and sedation with stable haemodynamic parameters and also prolongs duration of analgesia as compared with clonidine (1µg/kg) when used as an adjuvant to levobupivacaine 0.5% in peripheral nerve block

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